REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow. After amending the claims as set forth above, claims 1-9 are now pending in this application.

Applicant wishes to thank the Examiner for the careful consideration given to the claims.

Rejection of claims 1-2, 4-5, and 7-8 based on Tokoro

Claims 1-2, 4-5, and 7-8 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 4,631,043 ("Tokoro"). This rejection is traversed for at least the reason that Tokoro fails to disclose or teach the present invention.

(1) Background

As background, to suitably control the line pressure in accordance with an input torque from the engine, it is necessary to estimate the current engine torque, i.e., to get an estimated engine torque. Conventionally, there are two methods for estimating the engine torque. One method involves a target torque signal being inputted based on an engine speed and a target speed, and based on the value of the target torque signal, an estimated torque is derived. The other method involves a calculation of an actual engine torque with respect to a given parameter for getting an actual torque signal, and based on the value of the actual torque signal, the estimated torque is derived.

At present, the second method has been widely used. In the second method, when the engine is under a normal operation condition, an accurate actual torque signal is obtained that exactly corresponds to the actual engine torque. However, the actual torque signal produced is based on an engine control that is made based on the target torque signal. As a result, the input is subjected to a delay as compared with the target torque signal when the accelerator pedal is suddenly depressed for the purpose of sharply accelerating the vehicle. Accordingly, for a time period between the input of the actual torque signal and the control of the line pressure or the shifting of the pulleys, there is a response lag, particularly when the accelerator pedal is suddenly depressed.

In view of the abovementioned drawbacks, the present invention is provided in which, according to one embodiment, a target torque signal (the input of which is obtained earlier than an actual torque signal) is combined with the actual torque signal (the accuracy of

which is higher than the target torque signal) to prepare a so-called composite signal. Based on the composite signal, the estimated torque is obtained. With this composite measure, the drawbacks of the conventional systems is eliminated. In other words, in an embodiment of the invention, the respective superior portions of the two abovementioned methods are practically used for optimally controlling the line pressure.

(2) Tokoro does not teach the amended features of claims 1, 4, and 7

Turning attention to the claims, claim 1 (as amended) requires an ECU programmed to "input a first torque signal obtained by estimating an estimated engine torque in accordance with an engine rotation speed and the target shift ratio in accordance with vehicle operating conditions; input a second torque signal obtained by detecting an actual engine torque, wherein the actual engine torque is derived by calculating at least the engine rotation speed and a fuel injection period; synthesize the first and second torque signals to provide an estimated-torque signal; and control the line pressure in accordance with the estimated-torque signal." Claim 4 recites similar features. Support for the amendments is provided, among other places, in paragraphs [0018] and [0024] of the specification. With these amendments, it is made clear that the first torque signal is a factor that determines an output torque of the engine at the time when the operation condition of the vehicle changes, whereas the second torque signal is a signal that indicates a current torque that is being outputted by the engine. Accordingly, based on the first torque signal, the output of the engine changes and, as a result, the second torque signal changes with a delay. Thus, the first torque signal and the second torque signal are completely different from each other. Tokoro does not teach or suggest these features.

In particular, Tokoro merely discloses that a periodic gap between an input shaft torque and an output shaft torque is detected for finding a slippage of the belt. Tokoro fails to disclose or suggest a signal that corresponds to the first torque signal (i.e., an estimated engine torque estimated in accordance with an engine rotation speed and the target shift ratio in accordance with vehicle operating conditions), a signal that corresponds to the second torque signal (i.e., an actual engine torque derived by calculating at least the engine rotation speed and a fuel injection period), and that the first and second torque signals are synthesized to provide an estimated-torque signal. Thus, Tokoro does not teach or suggest the features of claims 1 and 4.

Claim 7 (as amended) is drawn to a method requiring the steps of "inputting a first torque signal obtained by estimating an estimated engine torque in accordance with an engine rotation speed and the target shift ratio in accordance with vehicle operating conditions; inputting a second torque signal obtained by detecting an actual engine torque, wherein the actual engine torque is derived by calculating at least the engine rotation speed and a fuel injection period; synthesizing the first and second torque signals to provide an estimated-torque signal; and controlling the line pressure in accordance with the estimated-torque signal." As discussed above, Tokoro does not teach or suggest the claimed first and second torque signals or synthesizing the first and second torque signals to provide an estimated-torque signal required by claim 7. Thus, claim 7 is allowable over Tokoro.

(3) Unaddressed Arguments

In the Advisory Action mailed January 11, 2007, the PTO failed to address Applicant's traversal of the rejections in the After Final Reply filed on December 21, 2006, contrary to the guidelines set out in MPEP 707.7(f). ("Where the applicant traverses any rejection, the examiner should, if he or she repeats the rejection, take note of the applicant's argument and answer the substance of it.") The Applicant now repeats the arguments in the hopes that the PTO will provide a detailed rebuttal as to why the arguments were not considered persuasive.

Tokoro merely shows a belt-type continuously variable transmission 4 that includes an input disc unit (pulley 6,7), an output disc unit (pulley 8, 9), and a belt 11 placed around the input and output disc units. A control unit 100 is employed to control the operation of the transmission 4. The control unit 100 is configured to: (1) calculate, for each given time, an amplitude ratio between a vibration component of the torque of the input disc unit that corresponds to the engine explosion interval and that of the torque of the output disc unit that corresponds to the engine explosion frequency; and (2) reduce the line pressure when a rate of the present amplitude ratio relative to a preceding amplitude ratio is greater than a predetermined value or increase the line pressure when the rate is smaller than the predetermined value. (Figs. 4-5 of Tokoro.)

More specifically, the amplitude of the torque of the input disc unit that corresponds to the engine explosion frequency is represented by "A_{in};" the amplitude of the torque of the output disc unit that corresponds to the engine exposition frequency is represented by "A_{out};" and the amplitude ratio is presented by "A_{out}/A_{in}." In the case of "line pressure $P_L > P_{L1}$," the

amplitude ratio "A_{out}/A_{in}" is kept at a generally given value near one even when the line pressure "P_L" is slightly reduced (column 5, lines 14-29 of Tokoro) because the rotations of the input disc unit and the output disc unit are completely synchronized. While, in the case of "$P_L < P_{L1}$," slipping occurs between the belt and the input and output disc units as the line pressure "P_L" is lowered, and thereby suddenly lowering the amplitude ratio "A_{out}/A_{in}." (Column 5, lines 14-29 of Tokoro.) In the case of "line pressure $P_L = P_{L2}$," the belt shows a complete slippage against the output disc unit. (Column 5, lines 14-29 of Tokoro.)

In Tokoro, by processing the output signals of the torque sensors 29 and 30, the value "Aout/Ain" (the ratio of the amplitude of the torque on the output shaft and the amplitude of the torque on the input shaft) is detected. Then, control is made such that the line pressure P_L is adjusted to a value approximately equal to "P_{L1}" in accordance with "A_{out}/A_{in}" (which lowers with the reduction of the line pressure). (Column 5, lines 30-43 of Tokoro.) More specifically, by increasing or decreasing the line pressure, the increase or decrease of the value "A_{out}/A_{in}" is detected, and the line pressure is controlled to a value that is taken just before the time when the value "A_{out}/A_{in}" becomes smaller than a predetermined value. That is, the slippage of the belt is detected by checking a time lag between the input torque and the output torque.

In an alternative embodiment, the phase difference between the torques on the output shaft and the input shaft is monitored to control the amount of hydraulic pressure supplied to the CVT 4 instead of the ratio of the amplitude of the torque on the output shaft and the amplitude of the torque on the input shaft. (column 9, lines 30-48 of Tokoro.)

In contrast, the technique of the present invention comprises the actual engine torque and the estimated engine torque being combined to produce an estimated torque signal. The PTO asserts, however, in the "Response to Arguments" section in the Office Action dated September 26, 2006, that:

> Tokoro does indeed disclose first and second torque signals (from sensors 29 and 30) that are clearly connected to the ECU program in Figure 1. Both the sensors detect or estimate engine torque both directly and indirectly. Sensor 29 directly measures the engine torque along the shaft (2) of the engine and sensor (30) indirectly measures the engine torque along the output shaft (30)(sic) of the system. These two signals are sent to the ECU to program... (Paragraph 7 of the Office Action dated September 26, 2006.)

It is respectfully submitted that Tokoro does not teach what the PTO asserts. The sensor 29 detects the torque of the input shaft and sensor 30 detects the torque of the output

shaft. Signals from these sensors are used to determine either the ratio of the amplitude of the torque on the output shaft and the amplitude of the torque on the input shaft or the phase difference between the torques on the output and input shafts. Even if the sensor 29 directly measures the engine torque along the shaft 2 or the sensor 30 indirectly measures the engine torque along the output shaft 10, there is no disclosure or suggestion that an estimated engine torque is determined and used to obtain a first torque signal, which is synthesized with a second torque signal obtained by the detected engine torque. The assertion by the PTO that "[b]oth sensors...estimate engine torque both directly and indirectly" is not supported by the teachings of Tokoro because Tokoro teaches no such estimation but the reference merely teaches the use of the sensors 29 and 30 to directly measure the torques of the input and output shafts, respectively. Thus, the signal from the torque sensor 29 (or the signal from the torque sensor 30) is not an estimated engine torque signal but merely an actual shaft torque signal.

In view of the above reasons, Tokoro does not teach or suggest the features of claim 1, 4, or 7. Claims 2, 5, and 8 depend from claim 1, 4, or 7 and are allowable therewith, for at least the reasons set forth above, without regard to the further patentable limitations contained therein. For at least these reasons, favorable reconsideration is respectfully requested.

Rejection of Claims 3, 6, and 9 based on Tokoro and Hendriks

Claims 3, 6, and 9 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Tokoro in view of U.S. Patent 5,431,602 ("Hendriks"). Claims 3, 6, and 9 depend from one of independent claims 1, 4, and 7 and contain all the limitations of their respective independent claims. As presented above, Tokoro does not teach or suggest the claimed first and second torque signals or synthesizing the first and second torque signals to provide an estimated-torque signal as required by independent claims 1, 4, and 7. Hendriks does not cure these deficiencies. Thus, claims 3, 6, and 9 are allowable for at least these reasons without regard to the further patentable limitations contained therein. Favorable reconsideration is respectfully requested.

Conclusion

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check or credit card payment form being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

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By

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